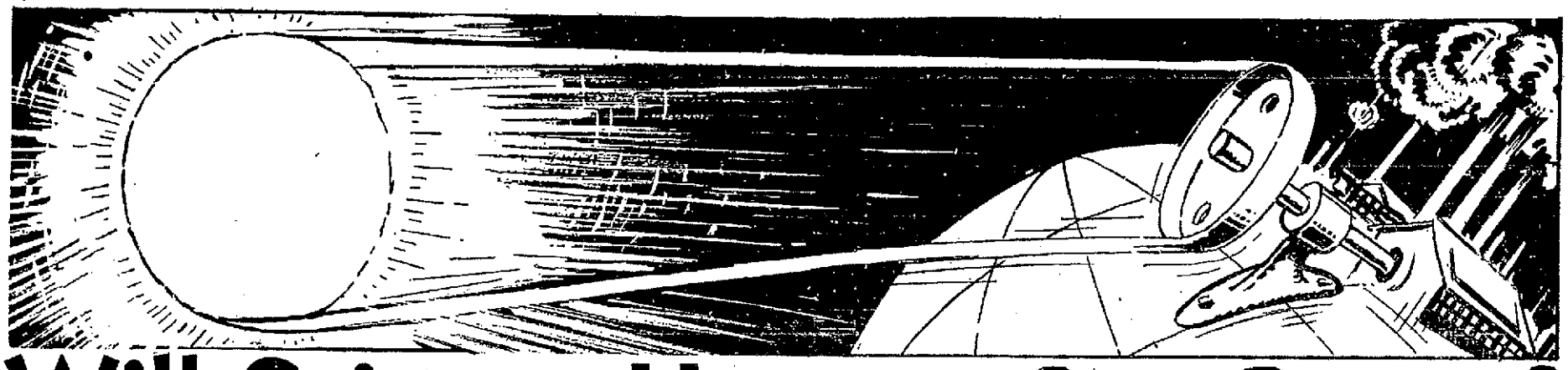


Will Science Harness Sun Power?

By DR. FRANK THONE

ONCE the present world-wide orgy of destruction has come to an end, there will be a tremendous job of reconstruction to do. Ruined cities, factories, power stations will have to be rebuilt, wrecked railroads and highways relaid, blasted mines and oil wells reopened, sunken ships replaced.

So vast does the task loom even now, with perhaps the worst days of wrath still to come, that many despair, and can see only the Ragnarok, the end of Occidental civilization that Spengler and other prophets of doom offered us in their nightmares of a couple of decades ago. Such pessimists talk of a lapse into a new Dark Age period, like the centuries of stagnation that followed the Fall of Rome.

It is not easy to maintain a cheerful front in the face of the whirlwinds of evil that are now wasting the world. Yet historical-minded persons may get some comfort from the fact that the last time the human race went through a period resembling the present, Western civilization emerged into a century of material progress and prosperity that surpassed anything that the world had ever seen.

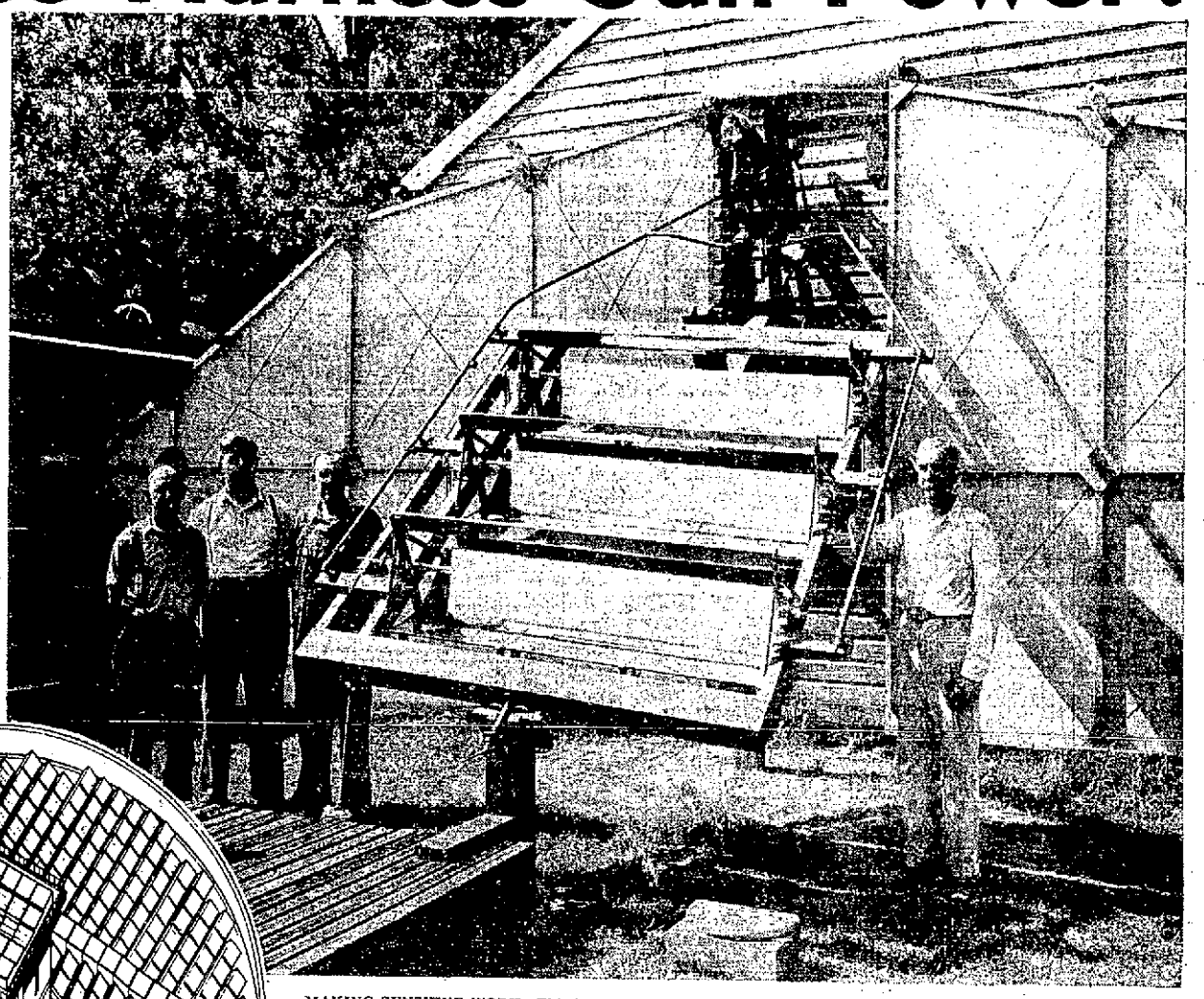
Europe, and the then young nations of the Americas, came out of the era of the French Revolution, and the Napoleonic wars that followed, in bad shape. Manpower had been decimated in battle, cities and farms burned in a score of lands, money dissipated in nearly a quarter-century of strife. National debts, of seemingly bankrupting weight, had become permanent institutions.

But the return of peace let something loose in full scope that had only been felt in an initial, limited way before the long series of wars had put the brakes on more constructive human effort. Social scientists call it the Industrial Revolution. Basically, it meant simply the application of mechanical power, especially steam, to work until then done mainly by the muscles of men and animals; spinning, weaving, blacksmithing, freight hauling, passenger transportation.

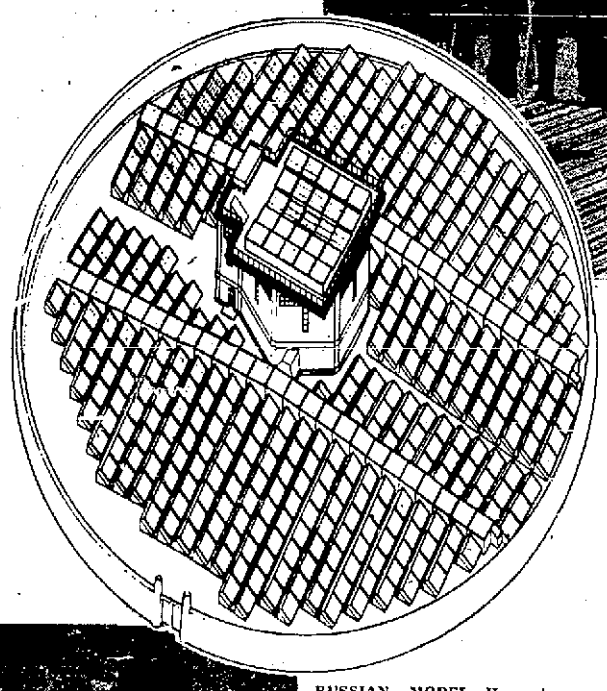
WHEN the present war broke, many of the best minds among our scientists and engineers thought they saw the beginnings of another Industrial Revolution that would make the one of the 18th century look small and tame. That a group of madmen in one European country should choose to misapply the early forms of these new energies to the task of killing and conquering and enslaving their neighbors, they hold, is an unfortunate, but temporary interlude. After the lunatics have been subdued and put into their proper cells, we can get back to the job of capturing new forces of nature and setting them to do the useful work that rational men may demand of them.

In the immediate task of reconstruction that must follow the last cannon-shot, we shall have to make use of every available crumb of natural energy we can capture, to ease the shortages in coal, oil, water-power caused by the vast waste of war, and the self-sabotage of mines, wells, dams committed by hard-pressed defenders to prevent their use by advancing aggressors.

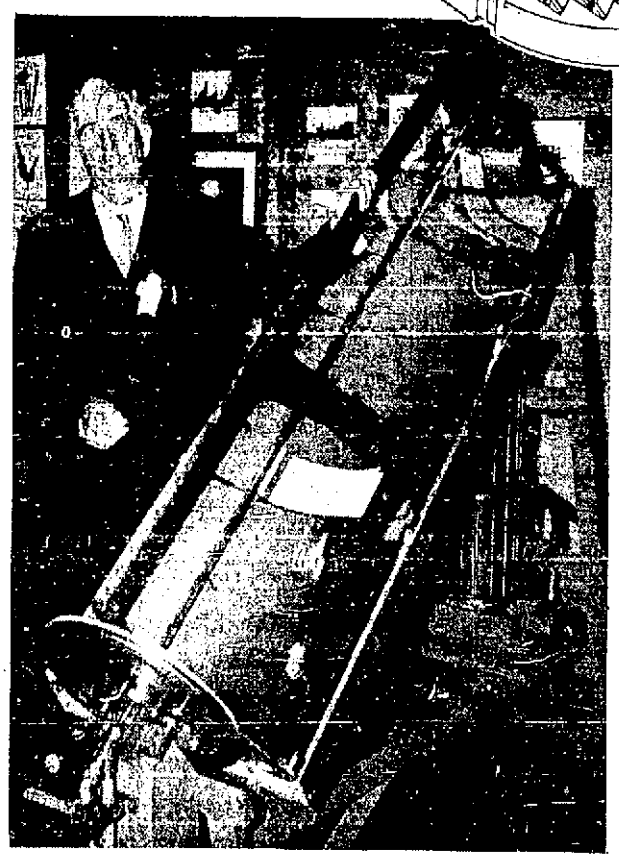
It is not remarkable, therefore, that men are again squinting up at the sun, pouring forth a flood of energy into space, and wondering if something cannot be done to capture and use at least a little of it. It is the same kind of feeling that seizes all of us when we stand at the brink of a waterfall that hurls itself unchecked and unharnessed from a high cliff, spending its energies in empty thunder instead of turning wheels and lighting lamps.



MAKING SUNSHINE WORK—This battery of three trough-shaped solar heating units will capture enough energy to run a one-half horsepower motor. Expansion of this idea into vast sunshine gathering groups of reflectors may solve energy problems.



RUSSIAN MODEL—Here is a Soviet engineer's dream of a huge solar-power plant. Acres of mirrors generate power.



EARLY DESIGN—Dr. Charles G. Abbott, pioneer in converting solar energy into useful work, displays one of his first generators.

Of course, some didactically-minded bystander is sure to remind us that all the forms of energy at present used on earth were originally sun-power. Coal and oil were once parts of plant tissue, formed through the capture of sunlight by chlorophyll. Water-power is possible only because the sun evaporates water from the ocean and releases it as rain on mountain tops, to run downhill and turn turbines. Even the wind that turns windmills blows because the sun warms air somewhere and causes it to rise, letting other air flow along the ground. And so on.

But this does not satisfy the modern power-minded sun-worshiper. He wants to see something more direct done about it.

PROJECTS for capturing sun-power by direct means usually depend on focusing the diffuse heat in sunlight on some selected spot, making it hot enough to raise steam and thus run an engine or other source of useful work. This idea is the readiest and most likely to occur to anybody who has ever set fire to a bit of paper with a hand-lens.

Several solar heating plants have actually been built, in which the focusing device consisted of a battery of big lenses, so set as to converge their beams on a small boiler. One of them, at least, failed because the heat was so great that it weakened the steel of the boiler wall, and the machine blew up!

Lenses are heavy, hard to make, expensive. Concave mirrors, which focus the sun's rays just as effectively, are lighter, easier to make, cheaper. So most solar heating devices use reflectors rather than lenses.

Many such devices have employed circular reflectors, more or less like the great saucer-like mirrors of reflecting telescopes or the reflectors of searchlights. These, of course, bring the rays to focus at a point.

It has occurred to some experimenters, however, to use trough-shaped rather than saucer-shaped reflectors. These focus the light along a line instead of at a point. If a black pipe containing a liquid is placed where that line of blinding light and blistering heat will strike it, its temperature will be raised accordingly.

PROMINENT among the scientists who have experimented with solar power plants built on this principle is Dr. Charles G. Abbott, secretary of the Smithsonian Institution. He has worked on them for many years, constantly bringing them to higher efficiencies, until he states he can now produce electric current, at least on a small scale, for costs comparable with those of a small steam-engine setup using conventional solid or liquid fuel.

The liquid in the pipe on which Dr. Abbott focuses the sun's heat rays is not water, but a thicker fluid with a considerably higher boiling point. This is slowly circulated through the pipe, and brought into contact with water in a small boiler near one end of the trough-shaped reflector. This has been found to be a more efficient way of raising steam than the direct circulation of water past the line of focus.

How long it may take for little power plants like this to grow into big ones it is hard to guess. But when we look back at the steam engines and steamships that the world knew at the end of the Napoleonic wars, only 125 years ago, and compare them with the monsters of today, who will be so rash as to prophesy that these infant solar power plants will never reach full stature?

While we may have to wait a while, however, before we see ten-thousand-horsepower solar power plants furnishing current for whole towns, it is already possible for the ordinary householder to capture and use some of the solar energy that is poured on his roof every sunshiny day. Dr. Abbott has devised solar cookers in which he has prepared many a tasty meal.

IN various sunny parts of this country, especially in the Southwest and in Florida, many property owners are saving themselves money by using solar heat to keep their hot-water tanks to the desired temperature. Recently Dr. F. A. Brooks of the California Agricultural Experiment Station, Davis, Calif., made a survey of such domestic solar-heating installations, and estimated that there are at least 50,000 of them—maybe as many as 100,000.

When the world stops destroying and starts rebuilding, vast new sources of power will be needed. Can the sun supply that demand?

No special reflectors are needed for these relatively low-temperature installations. A long, shallow box, glassed on top and insulated with rock or glass wool on sides and bottom, contains several coils of black iron pipe. It is laid on the sunny slope of the roof, usually facing south. Connections bring cold water to the lower end of the coil, carry warmed water away from the upper end to the storage tank.

No pump is needed; the natural difference in density between warm and cold water keeps it moving. Warm water stored during the day is usually sufficient for all household needs until the following morning.

THE search for practical and profitable means for developing power from sunlight is not being left to the zeal and enthusiasm of any single scientist. Continuity in the research program has been assured by an endowment of $647,000, given to the Massachusetts Institute of Technology by Dr. Godfrey Lowell Cabot.

A program of investigations into three ways of converting sunlight into power, by chemical, mechanical and electrical means, is now under way. It is estimated that the work will go on for at least 50 years.

While most of the solar power plants thus far constructed are based on the idea of using focused heat in the generation of steam, that is not the only possibility. It has been shown that light falling on a metal plate coated with a film of copper oxide will produce at least a weak current of electricity directly. Up to now, this principle has not been used for driving anything bigger than "one-fly-power" motors, but there is no telling what may come of it in the end, if more efficient photoelectric plates can be developed.

One of the greatest drawbacks in present-type solar power setups is the great area required for the mirror surfaces. For a power plant supplying the needs of even a small town, several acres of reflecting surface would have to be kept exposed. This would of course run first costs up considerably, and upkeep of the mirrors, especially keeping them bright and untarnished, would also be a considerable item.

There would also be the large number of heating units, each with its connections to be kept leak-proof. Simplification and increased efficiency must be the constant goals of solar power engineers for a long time to come.

Science has proved sun power can be put to work, just as Watt harnessed steam and Faraday brought electricity out of the atmosphere into the factory. But the application of steam and electricity to man's work was not accomplished overnight. The capture and direction of sun power may take longer.

At least, we have a start. Return to normality will provide opportunity for developing the idea. Don't laugh at the possibility of the sun pushing your car. The world has a habit of ridiculing those who do the most for it.

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